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Living on the Edge: Dietary Strategies of Economically Impoverished Women in Cali, Colombia

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ABSTRACT Economically impoverished women in Cali, Colombia, have restricted access to food in a city where food is abundant. Ethnographic observations, interviews and 2 day food records were used to better understand the coping strategies used by a group of these women (n = 85) to maintain adequate levels of energy intake. Anthropometric indicators of nutritional status were normal for the group. Interview data revealed that the ability to purchase food was a concern for 58% of the women. When faced with a restricted ability to purchase food, the women indicated they made compromises in meal composition, reduced portion sizes, and/or reduced the number of meals. They also relied on relatives, friends, neighbors, store credit, or local government programs for access to food. Changes in meal composition were identified in 17.1% of all diet records (n = 509). Low energy intake (defined as energy intake $\leq 1.27 \times$ BMR) was identified in 17.1% of all diet records. Carbohydrate consumption was significantly greater on low-energy intake days. The adequate nutritional status of this group of women suggests that their coping strategies are usually adequate to maintain energy intake, but the presence of uncertainty, the frequency of compromises in diet composition, and the frequency of low-energy intake days suggest that these women are at risk for undernutrition. Am J Phys Anthropol 102:5–15, 1997.

The association between urban poverty and undernutrition in developing countries is well known (Basta, 1977; Hussain and Lunven, 1977). Most studies of the urban poor have related measures of household income (Aguillon et al., 1985; Pryer, 1993; Victor et al., 1986) or other socioeconomic indicators (Zeitlin et al., 1978) directly to anthropometric indicators of nutritional status. Few studies have looked at intermediate variables, like behavior, that link income to diet and hence to nutritional status. The aim of this paper is to explore behavioral responses to economic constraints on food availability and the potential effects of this behavior on nutritional status. We do this using data from a larger study of the energy nutrition of economically impoverished women living in Cali, Colombia.

Cali is a city of approximately 2 million people in which there are notable disparities in living standards and health among socio-

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economic classes. Although in Colombia as a whole per capita food intake is adequate and food security not an issue (Mora et al., 1992; Romero, 1988), access to adequate amounts and types of food is potentially a problem for the poor living in urban areas (World Bank, 1990). For these people a salient feature of the urban environment is that food is abundant in the marketplace throughout the year, but the money to purchase food, as well as other goods, is a limited resource.

To better understand how women in the low socioeconomic stratum (SES) of the city respond to economic constraints on their ability to obtain food, we have used the theoretical framework of adaptation and conceptualized economic constraint as an environmental stressor (Thomas et al., 1989). Following Slobodkin (1968) and Thomas et al. (1979), we predicted that behavioral responses, or coping strategies, would be used to maintain food intake. Further, we hypothesized that these coping strategies would be hierarchically ranked such that those used to maintain adequate macronutrient intake would be used first and serve to buffer the women against the need for response at a biological level. Responses at a biological level, such as reductions in body weight and basal metabolic rate (BMR), would be a considered a second line of defense. It follows from this that undernutrition in a population is evidence of the inadequacy of behavioral coping strategies relative to the degree of stress.

In this paper we focus on the coping strategies of poor Cali women to economic constraints in obtaining food and the potential consequences of these strategies on their biology. In particular we have three objectives: 1) to describe the coping strategies Cali women articulate; 2) to examine diet intake records for evidence of those coping strategies as well as dietary adequacy; and 3) to discuss the potential biological consequences of the coping strategies identified.

METHODS

Setting and subjects

The women who participated in this study lived in two barrios on the periphery of the city of Cali. Both were classified as low SES by the municipal government (EMCALI, 1982), and both traced their beginnings to the mid-1970s. The first barrio originated from the unauthorized sale of house lots on privately owned agricultural land. The residential units were small (mostly) brick houses, some of which were still under construction. By 1994 most of the houses were connected to city electricity, water, and sewerage. The second barrio began as an invasion along the irrigation ditches of an agricultural plot. By 1994 many of the older residents living in the center of the barrio had gained legal title to their house lot, but there was still active invasion along the periphery. The residential units were small houses, many of which were still either under construction or temporary structures made of recycled materials. Most of the houses had access to electricity and water through connections the barrio residents themselves had engineered. Some residents had also made arrangements for drainage of household waste to nearby ditches. Both of the barrios had a government supported health post and small elementary school. Neither had paved streets, adequate street lighting, or telephone service, but both had solid waste disposal provided by the city.

The subjects were 85 nonpregnant, nonlactating women between the ages of 19 and 43 years. All were volunteers and in good health during their participation in the project. The project was designed so that each subject participated in three rounds of measurements with 3 months between each round. Measurements in each round were completed during a 5 day period and included anthropometry and interviews, 2 days of dietary intake records, and measurement of BMR on 2 successive days, as well as other measurements not reported on here. All measurements on all women were completed between August 1990 and May 1995.

Ethnographic observations and sociodemographic characteristics

General living conditions and housing quality as well as local food availability and patterns of food use were assessed through observation. Socioeconomic and demographic data were obtained through structured interviews done by trained technicians. The SES indicators included house construction char-

acteristics, presence of municipal services, and house ownership.

Anthropometry and hemoglobin status

Anthropometric measurements were taken by a single trained technician following standard techniques described by Lohman et al. (1988). Body weight was measured with a Homs Beam Balance (±25 g) with the subjects lightly clothed and without shoes. Height was measured using a wall stadiometer, and skinfold thicknesses were measured in triplicate on the left side using a Lange skinfold caliper. Mid-upper arm circumference (MUAC) was measured on the left side with a flexible tape and upper arm muscle area (UMA) calculated using the equation of Frisancho (1990). Body mass index (BMI = weight, kg/height, m^2) was used as the measure of nutritional status. Blood hemoglobin concentration was determined on fingertip samples by the cyanmethemoglobin method.

Dietary intake

Dietary intake was assessed through food records kept for two consecutive weekdays by trained observers from the two barrios. Food quantities were recorded in local serving sizes and later converted to metric units. The conversion to metric units was based on volumetric measurements of serving utensils, plates, and cups completed in each subject's home before observations of food intake began. Energy and nutrient intakes were calculated from published food composition tables (Instituto Nacional de Nutrición, 1988; Pennington and Church, 1985; USDA, 1994), local recipes collected from women in the study, and chemical analyses of common foods. Energy intake in kilocalories/day and 2 day mean intakes in kilocalories/day were calculated for each woman. Patterns of food intake and meal composition were determined through analysis of the food intake records.

Household food security and coping strategies

Subjects' perceptions of their financial ability to purchase food were obtained for a subsample (n = 58) of women in the larger study through a structured interview done by trained observers from the two barrios. One of the questions asked was, "Do you have enough money to buy food?" Women had the option of responding *always, almost always, sometimes,* and *never.* Semistructured interviews were done with a subsample (n = 92) of women in the larger study of which this is part on a separate occasion by Staten to obtain information on weekly expenses and to learn to whom women turned when they needed money for food or other purchases (Staten, 1995). With regard to the latter, the question asked was, "When you need to buy food, clothes or something else but do not have any money, whom do you ask for help?" Focus group interviews done by Dufour were used to obtain information on ideal meals and meal patterns and modifications in both meal composition and meal pattern made under constrained economic circumstances.

Calculation of low energy intake days

In order to identify potential instances of undereating in the dietary intake records, we categorized daily energy intakes $\leq 1.27 \times$ BMR for 24 h as low-energy intake days and those $> 1.27 \times$ BMR as normal. The value $1.27 \times$ BMR for 24 h corresponds to the FAO/WHO/UNU (1985) "survival" requirement. It is a level of energy intake which allows for "minimal movement; it is not compatible with long term health and makes no allowance for the energy needed to earn a living or prepare food" (FAO/WHO/UNU, 1985:73).

BMR was measured in each subject's home in the early morning on two weekdays. Subjects were instructed not to eat or engage in any activity until the technical team arrived to take the measurement. The technical team arrived between 0600 and 0700 h and in most cases awakened the subject on arrival. Measurements of BMR were done using standard techniques of indirect calorimetry. The procedures are described in detail in Spurr et al. (1994).

Statistical analysis

Unpaired *t*-tests with unequal variances were calculated to compare BMI and energy intake with SES indicators such as house ownership and three SES indexes. In the

first SES index, rankings for floor type and house ownership were summed. Floor type was a five point scale ranging from polished stone (1) through cement, wood, dirt, and other (5). House ownership status was also a five point scale ranging from ownership (1) to *arrimado* or non–rent paying (5). These variables were selected as they were significantly correlated with BMI in earlier analyses. A second index added the presence/absence of sewerage, and the third index added a variable for number of children (≤ 4 or >4). The last two variables were included based on a backward stepwise regression with BMI as the dependent variable. Each index was split into a higher and a lower SES group by dividing the range of scores in half. Unpaired *t*-tests with unequal variances were also calculated to compare low and normal energy intake days for carbohydrate, fat, and protein intake per 1,000 kilocalories. Pearson's correlation coefficients were calculated with BMI and energy intake as the dependent variables and years of schooling as the independent variable.

RESULTS

Socioeconomic characteristics

Based on data from their first round of participation, subjects had an average age of 28.9 years and an average of 6.4 years of schooling. The majority lived in a house that had at least one permanent brick wall (74.1%) and cement or polished stone floors (78.8%). The rest lived in houses with walls of wood planks, split bamboo, and/or recycled materials and floors of wood or dirt. Less than half (42.5%) of the women engaged in income-generating activities. The activities included selling, on the street or from a house (44.4%), work as *Madre Comunitarias* (community mothers) in a government-supported child care program (22.2%), and work in domestic service (19.4%). None of these activities, with the possible exception of domestic work, paid minimum wage or above. Income-generating activities were carried out in addition to the household tasks for which the women were responsible. Most of the women (>60%) had lived all their lives in urban settings, and approximately 29% lived in female-headed households at the time of the study (Staten, 1995).

TABLE 1. Characteristics of women (n = 85) in study[1]

Characteristic[2]	Mean ± sd
Age, years	28.9 ± 6.2
Height, cm	155.6 ± 6.1
Weight, kg	54.0 ± 7.3
MUAC, mm	25.1 ± 2.1
Triceps skinfold, mm	18.7 ± 5.4
BMI, kg/m^2	22.3 ± 2.6
UMA, cm^2	29.7 ± 5.3
Hemoglobin, g/dl	13.3 ± 1.3

[1] Data from first round of measurements. See Methods.
[2] BMI = body mass index; MUAC = mid-upper arm circumference; UMA = upper arm muscle area.

Anthropometric characteristics

Anthropometric characteristics and hemoglobin status from the first round of data collection are shown in Table 1. Mean height was 155.6 ± 6.1 cm. This is on about the NCHS fifteenth percentile and considered indicative of past undernutrition (Waterlow, 1994). Mean BMI was 22.3 ± 2.6, which is in the normal range. Some 5.9% of the women had BMIs of <18.5, the cutoff for undernutrition (James et al., 1988), and 3.5% had BMIs >27.3 and would be considered at risk for the health complications of obesity (Must et al., 1991; Pi-Sunyer, 1991). Mean MUAC was 25.1 ± 2.1, and 5.9% of the women had MUACs of <22 cm, which is indicative of undernutrition (James et al., 1994). Only one woman (1.1%) would be classified as undernourished based on both BMI and MUAC (James et al., 1994). Mean UMA was 29.7 ± 5.3 cm^2, which is at about the fiftieth percentile for USA women and indicative of normal nutritional status (Frisancho, 1990). BMI was significantly greater in women who owned the house in which they lived (*t*-test, $t = 2.03$, $df = 83$, $P < 0.05$) in round 1, but differences in BMI were not associated with measures of housing quality (walls, floors, sewerage) or years of schooling.

The mean hemoglobin value was 13.3 ± 1.3 g/dl, and 10% of the women had hemoglobins of <12 g/dl, concentrations below which anemia is likely (Brothwell and Charlton, 1981).

Dietary intake

Energy and macronutrient intakes for each round are shown in Table 2. Based on the round 1 data, mean dietary energy intake

TABLE 2. Dietary energy and macronutrient intake (2 day means) of women by round[1] of participation

Measurement	Energy (kcals)	Protein (g)	Carbohydrate (g)	Fat (g)
Round 1 (n = 85)	2101.8 ± 417.5	62.1 ± 15.9	374.4 ± 81.4	43.3 ± 12.9
Round 2 (n = 85)	2137.1 ± 607.6	61.4 ± 19.9	380.2 ± 104.1	45.8 ± 20.5
Round 3 (n = 84)	2078 ± 451.8	59.9 ± 15.7	365.0 ± 80.7	45.3 ± 16.0

[1] Food intake records were collected at 0, 3, and 6 months. Each data collection period is referred to as a round. See Methods.

was 2,101.8 ± 417.5 kcal/day, which is 1.72 ± 0.38 × BMR. Values ranged from 1.02 × BMR to 2.78 × BMR. Mean daily protein, carbohydrate, and fat intakes were 62.1 ± 15.9 g, 374.4 ± 81.4 g, and 43 ± 13 g, respectively. Protein accounted for 11.6%, carbohydrate 70.1%, and fat 18.3% of total energy intake. The most important sources of energy were white rice (23.0%), black sugared coffee, hot chocolate and *agua panela* (sugar-water drink) (14.3%), white bread (7.5%), beef (6.1%), beans (6.7%), and plantains (4.4%). Together these accounted for 62% of dietary energy. No significant associations were found between energy intake, expressed as a 2 day average or multiple of BMR, and any of the SES variables.

Ethnographic observations

Ethnographic observations indicated that women bought most food at the small stores within their barrio. These stores sold a range of common foods, including grains, legumes, meat, dairy products, and fresh fruits and vegetables. Some women brought dry goods (beans, rice, coffee, sugar, etc.) by the week from open-air markets outside the barrio and fresh products (bread, meat, fruits, vegetables) daily at local stores. The poorest women bought all food by the day, or by the meal, from local stores.

We observed some cases in which women did not have money to purchase food. In these cases there appeared to be three options: 1) rely on neighbors or kin for food and/or money to buy food; 2) buy food on credit; 3) rely on available social services and/or charity for access to food. One of the social services was the local government-sponsored child-care program which provided food for children in the program. In one case this food was also extended to a needy neighbor. In addition, one of the barrios had a government-supported restaurant that offered an inexpensive midday meal.

TABLE 3. Responses of women (n = 57)[1] to question "Do you have enough money to buy food?"

Response	Respondents (%)
Always	24.1
Almost always	15.5
Sometimes	53.4
Never	5.2
No response	1.7
Total	100

[1] Includes only one round (see Methods) for each women. Only nine of these women were included in the sample of 85, which is the focus of this paper.

Household food security and coping strategies

Responses to the question "Do you have enough money to buy food?" are shown in Table 3. Only 24.1% responded *always*. More than half (58.6%) of the women responded *sometimes* or *never*. In this group there were four women who were dependent on relatives for food, one who was dependent on a neighbor, and one who ate at a restaurant where she worked. In response to the question about what they (the subjects) would do when they did not have money to cover necessities (including food), 43.7% indicated they would rely on relatives (including in-laws), 26.1% on friends or neighbors, 16.3% on store credit, and 2.2% on an employer. The remaining 10.9% said they had no one they could ask for help (Staten, 1995).

In focus group interviews, women described the foods that should be included in meals and the meals that should be served during the day (Table 4). The midday meal was described as the principal meal of the day and was normally composed of rice, beef, fried plantain, salad, and either soup or beans. Chicken, pork, or fish could replace beef. A popular alternative was *sancocho*, a meat and plantain stew, served with rice. Dinner was described as a smaller meal

TABLE 4. Normal meals compared to meals compromised by economic constraint

Meal	Normal	Compromised
Breakfast	Scrambled eggs or fried offal	
	Bread	Bread
	Hot chocolate with cheese or coffee with milk	*Agua panela*[1]
Lunch	Rice	Rice
	Beef/poultry/fish	Eggs or no animal protein[4]
	Plantains	Plantains
	Lentils/beans or soup[2]	Lentils
	Salad[3]	
	Fruit juice or *agua panela*[1]	*Agua panela*[1]
Dinner	Bread	Bread
	Hot chocolate with cheese or	*Agua panela*[1]
	Rice	
	Plantains	
	Lentils/beans or soup[2]	

[1] *Agua panela* is a sugar-water drink made with *panela,* a type of cane sugar which contains molasses.
[2] If lentils/beans are eaten for the midday meal, dinner would be soup and vice versa. *Sancocho,* a meat and plantain stew served with rice, would also be considered a normal midday meal.
[3] Salads vary considerably. A preferred type would have some combination of leafy greens, onions, and tomatoes; a simple one might be a slice of tomato.
[4] Egg rather than meat in the main meal was considered a very significant indicator of financial constraint.

served in the early evening. It could consist of leftovers from the midday meal or hot chocolate, cheese, and bread. Breakfast was described as consisting of a hot drink, like sugared coffee or hot chocolate, and bread as a minimum. A more ideal breakfast would also include eggs, fried viscera, or cheese. These meal and meal pattern descriptions were in close agreement with ethnographic observations. With the exception of bread, all of these foods were normally prepared in the household.

The focus groups also identified compromises women made when financial resources were not adequate to provide normal meals (Table 4). One compromise was to replace the meat/fish in the midday meal with egg, viscera, or animal parts (feet, tails, etc.), and another was to eliminate animal protein from the midday meal altogether. The latter was considered indicative of severe economic constraint because the midday meal was the principal meal at which meat or fish was consumed. A third compromise was to reduce portion size. For example, some kind of bread was considered essential for breakfast, even if everyone only received a small piece. A fourth compromise was to eliminate meals, beginning with the evening meal and then breakfast. The midday meal was considered the most important meal, and the women never suggested it would be eliminated but did indicate it would be shifted to later in the day if dinner were eliminated. Ethnographic information also underscored the importance of the midday meal and the inclusion of beef in that meal. Replacement of beef with chicken, pork, or fish was acceptable, but the replacement of beef with egg, viscera, or animal parts (like chicken head or foot) was not as acceptable.

Patterns of food use in diet records

In the diet records we were able to identify some of the compromises in meal composition the women described (Table 5). On 8.9% of all days, eggs, viscera, or viscera and egg were the only sources of animal protein, and on 8.2% of all days no animal protein was consumed. This indicates that on 17.1% of all days women did not follow the normal pattern of having meat or fish at the main meal or any other time during the day. There was, however, no significant association between number of days without animal protein and BMI or between percent of dietary energy derived from animal protein and BMI.

The majority of breakfasts were bread and a hot drink (sugared coffee or hot chocolate). The more ideal breakfasts including eggs or fried viscera or bread, cheese, and hot chocolate occurred on only 7.9% of days (round 1 data).

Because the elimination of meals was difficult to determine given the way the dietary intake data were coded, we assumed that both reductions in portion size and elimination of meals would result in low-energy intake. Low-energy intake days, defined as energy intakes of $\leq 1.27 \times$ BMR, occurred on 17.1% of single days and 13% of all 2 days averages (Table 6). Most individual women ($n = 61$) had only 1 day or no days of low-energy intake, and only a few had 4 or more days of low-energy intake ($n = 1$ for 4 days; $n = 3$ for 5 days). No women had all 6 days of intake as low-energy intake. In terms of the 2 day average

TABLE 5. Percent of dietary intake days containing animal protein by type for 85 women, 2 days of diet records each measurement round[1]

Measurement	Number of days	Percent of days				
		Meat[2]	Egg[3]	Viscera[4]	Egg or viscera[5]	No animal protein
All days						
Round 1	170	84.1	5.9	1.8	0.6	7.6
Round 2	170	80.6	7.6	1.8	0.6	9.4
Round 3	169	84.0	5.9	1.8	0.6	7.7
All rounds	509	82.9	6.5	1.8	0.6	8.2
Low-intake days[6]						
Round 1	27	51.8	7.4	3.7	3.7	33.3
Round 2	29	75.9	3.4	0	0.0	20.7
Round 3	31	64.5	16.1	0.0	0.0	19.3
All rounds	87	64.4	9.2	1.1	1.1	24.1

[1] Only 1 day of data for one woman in round 3. See Methods for a discussion of measurement rounds.
[2] Meat includes beef, pork, poultry, and fish (flesh and bones) and may include viscera or egg dishes in addition to the meat dish.
[3] Egg as only source of animal protein.
[4] Viscera as only source of animal protein. Viscera includes internal organs (like heart, lungs, liver, pancreas, intestine) as well as animal parts, such as chicken heads and feet and pig feet and tails.
[5] Both egg and viscera were the source of animal protein.
[6] Low-energy intake defined as $\leq 1.27 \times$ BMR.

TABLE 6. Percent of energy intakes $<1.27 \times$ BMR for 24 h for all food intake days and 2 day means for each woman (n = 85)

Measurement	Percent days			
	Single days		2 day means	
	n	%	n	%
Round 1	170	15.9	85	9.4
Round 2	170	17.1	85	14.1
Round 3[1]	169	18.3	84	15.5
All rounds	509	17.1	254	13.0

[1] One day of dietary data missing for one woman in round 3. See Methods for discussion of measurement rounds.

energy intake calculated for each measurement round, 17 women had low-energy intakes in one round, five in two rounds, and only two in all three rounds. There was a significant positive relationship ($r = 0.25$, $P = 0.02$) between the number of low-energy intake days and BMI.

Sources of animal protein on low-energy intake days are shown in Table 5. On 9.2% of low-energy intake days, egg was the only source of animal protein, and on 24.1% of these days no animal protein was consumed. Thus, a total of 35.6% of the low-energy intake days did not follow the normal pattern of including meat or fish at the main meal. On low-energy intake days, carbohydrate intake (calculated per 1,000 kcal) was higher (*t*-test, $t = 3.04$, $P < .01$) and fat intake lower (*t*-test, $t = -2.79$, $P < .01$), but neither total protein intake (*t*-test, $t = -1.73$, $P < 0.09$) nor animal protein was (*t*-test, $t = -1.88$, $P < 0.06$) significantly different. An example of meals on a normal and a low-energy intake day is shown in Table 7. Note that on the low-energy intake day the composition of the meals is not unusual, but the midday meal occurred later than usual, and there was no evening meal.

DISCUSSION

Nutritional status, as assessed anthropmetrically, was normal in this group of women. By BMI, only 5.9% could be classified as undernourished, and by BMI and MUAC combined less than 1% could be classified as undernourished. Mean energy intake was $1.72 \times$ BMR, a value that appears acceptable for women with the activity level of these subjects. Protein intake, 62 ± 15.9 g/day, is greater than the FAO/WHO/UNU (1985) safe level and therefore assumed to be adequate. The diet is high in carbohydrate, moderate in protein, and relatively low in fat. It is based on rice, sugar, bread, beans, and beef and broadly similar to that reported for urban households in the 1981 national survey in Colombia (Romero, 1988).

The subsample of women interviewed expressed uncertainty regarding their ability to purchase sufficient food. Indeed, 58.6% of the women interviewed indicated that they did not always have sufficient money to purchase food. This uncertainty occurred in

TABLE 7. Woman with normal energy intake day in round 1 (randomly selected day) and a low-energy intake day in round 2[1]

Time, (h)	Food consumed	Quantity (g)	Energy (kcal)
Round 1			
0716	Chewing gum	1	3
0936	Bread, margarine	65	236
	Kool-aid	155	56
	Hot chocolate	206	147
	Arepa, margarine	15	154
1100	Kool-aid	112	40
1324	Rice	204	344
	Plantain	40	85
	Peas	110	110
	Chicken, fried	24	69
	Salad (cabbage, onion, beets, oil, lemon)	72	12
	Pineapple juice	240	108
1522	Pineapple juice	240	108
	Rice	243	409
1616	Chicken, cooked	78	168
	Rice	290	489
1752	Rice, tomato sauce	146	240
	Kool-aid	240	86
	Total		2,865
Round 2			
1025	Hot chocolate	432	201
	Arepa	88	201
1532	Broth	80	15
	Rice	270	455
	Plantain	167	212
	Chicken liver	46	72
	Chicken foot	7	17
2028	Ice cream	60	37
	Total		1,210

[1] Food intake records were collected at 0, 3, and 6 months. Each data collection period is referred to as a round. See Methods.

an environment where food was plentiful in local markets but purchasing power low and variable. Household incomes were low, with a high percentage (58%) of all expenditures spent on food (Staten, 1995). This leaves little money available for other expenses. Further, because employment opportunities for barrio residents were generally restricted to the informal sector, income tended to be variable. For example, the income of women who worked as *Madre Comunitarias* was dependent on the number of children they cared for each day as well as when and if the parents paid for their care.

A similar perception of uncertainty that one will have access to sufficient food has also been found in low income women in the USA (Radimer et al., 1990). This perception of uncertainty is included in the definition of hunger: "hunger is the inability to acquire or consume an adequate quality or sufficient quantity of food in socially acceptable ways, or the uncertainty that one will be able to do so" (Radimer et al., 1990). With this definition, undernutrition, as defined anthropometrically, is a potential but not necessary consequence of hunger.

TABLE 8. Coping strategies used by women during periods of financial constraint

1. Replace meat/fish with egg, viscera, or animal parts
2. Eliminate animal protein foods
3. Reduce portion size
4. Eliminate meals
5. Rely on neighbors, relatives, and friends
6. Buy on credit
7. Utilize available social services

Cali women articulated a number of strategies for coping with financial constraint on food purchases. These are summarized in Table 8. The first of these coping strategies, substituting egg, viscera, or animal parts for meat/fish at the midday meal, was found in 8.9% of the diet records. These are socially significant changes in diet composition considered indicative of a lack of financial resources. In nutritional terms, however, they are substitutions within the category of animal foods and would not necessarily affect total energy intake or nutrient adequacy. Unfortunately, we do know if Cali women considered them equivalent in terms of their nutritional value or simply as items within the general category of animal products. The second strategy, the elimination of animal protein foods, occurred in 8.2% of the diet records. It is also a socially significant change in the diet but again one that would not necessarily affect energy or nutrient adequacy. Both strategies are compromises in diet composition that can function to maintain dietary energy intake. Interestingly, there was no significant association between percent of animal protein in the diet and BMI as a measure of nutritional status.

The third and fourth strategies listed in Table 8, reducing portion sizes and eliminating meals, were difficult to identify in the diet records. However, both are compromises in the quantity of food consumed and therefore likely to result in lowered energy and nutrient intake. The low-energy intakes which were found on 17.1% of all days are suggestive of these kinds of coping strate-

gies. In comparison to all dietary intake days, a higher percentage of the low-energy intake days (35.6% vs. 17.1%) also showed substitutions of egg and/or viscera for meat or contained no animal protein at all. These changes in diet composition provide support for the suggestion that reductions in energy intake were used as a coping strategy. In addition, we know from ethnographic observations that some low-energy intake days were the result of economic constraint. The example in Table 7 is one such case: in this household there was insufficient money to buy food because of the need to buy medicine for a family member who was ill.

Low-energy intakes as a response to constraints on food availability have been documented in a number of rural populations, including USA women (Radimer et al., 1990), Mexican village women (Messer, 1991), and African horticulturists (de Garine and Koppert, 1988).

For women in this study, low-energy intake days could result from a variety of factors other than economic constraint. These include intentional food restriction such as dieting, ill health, effect of the presence of an observer, or normal day-to-day variation in intake. Dieting is rare in this population. Only one woman in the sample reported that she was dieting, but all of her energy intakes were $>1.27 \times$ BMR and so were not included in the sample of low-intake days. To the best of our knowledge, none of the women in the sample were ill on the days dietary intake was recorded. An observer effect is always a possibility. However, for women in this study an observer effect would probably be associated with high rather than low food consumption because the latter is associated with not having money to buy food and is a source of embarrassment. Normal day-to-day variability could explain some of the low-energy intake days, but it is less likely to explain the low-energy intakes found in the 2 day means which occurred 13.0% of the time.

The cutoff we used to define low-energy intake, $1.27 \times$ BMR, is considered the "survival" level. It is unlikely to represent long-term habitual intake (FAO/WHO/UNU, 1985; Goldberg et al., 1991) and is not compatible with long-term health or the energy needed to earn a living (FAO/WHO/UNU, 1985). Prolonged low-energy intake would require biological accommodation in terms of reductions in body weight, BMR, and activity level (Ferro-Luzzi, 1990) and would negatively affect work capacity (Spurr, 1983).

The last three coping strategies in Table 8, relying on neighbors, friends, and relatives, buying on credit, and utilizing available social services, are strategies of a different type, and we do not know how frequently they were used. The first two could be used to maintain energy and nutrient adequacy, at least in the short term. They might, however, do so at the cost of household autonomy. The last strategy, the use of available social services, appeared to be widespread. Many women with young children utilized the government-supported child-care program which included food for children. Some also utilized the government supported midday meal program for their school-aged children and sometimes for themselves.

It is worth noting that the coping strategies identified are limited in number and only a subset of all possible strategies. We do not, for example, have evidence that scavenging or begging at restaurants, to name just a few other possibilities, were used.

On theoretical grounds we expected that the behavioral responses of poor Cali women would be hierarchically ranked such that responses maintaining energy intake (i.e., changes in diet composition) would be employed before those involving reductions in energy intake (i.e., reduced portion size and/or elimination of meals), since the latter could precipitate the need for biological accommodation. The data available, however, do not provide strong support for this expectation. Changes in diet composition occur equally as often as do low-energy intake days (17.1%). Although it is unlikely that all low-energy intake days were the result of economic constraint, we are certain that some of them are. This suggests that diet composition, at least in regard to animal protein, is sometimes maintained at the expense of energy intake. This is potentially a risky strategy. However, our finding of normal nutritional status in the women

studied indicates that their coping strategies are usually adequate to maintain energy intake in the long term, and days of low-energy intake were balanced by days of adequate or high-energy intake. As one women put it, "Cuando tiene come bastante y cuando no tiene no come" [When you have money you eat a lot, and when you don't have it you don't eat].

In conclusion, we found that economically disadvantaged women living in low SES neighborhoods in Cali, Colombia, had normal nutritional status and mean dietary energy intakes which appear to be adequate. However, the presence of uncertainty, the frequency of compromises in diet composition, and the frequency of low-energy intake days suggest that these women are at risk for undernutrition.

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